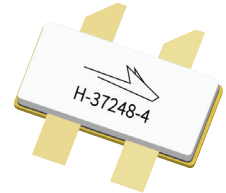


# PXAC201202FC

## Thermally-Enhanced High Power RF LDMOS FET 120 W, 28 V, 1800 – 2200 MHz

### Description

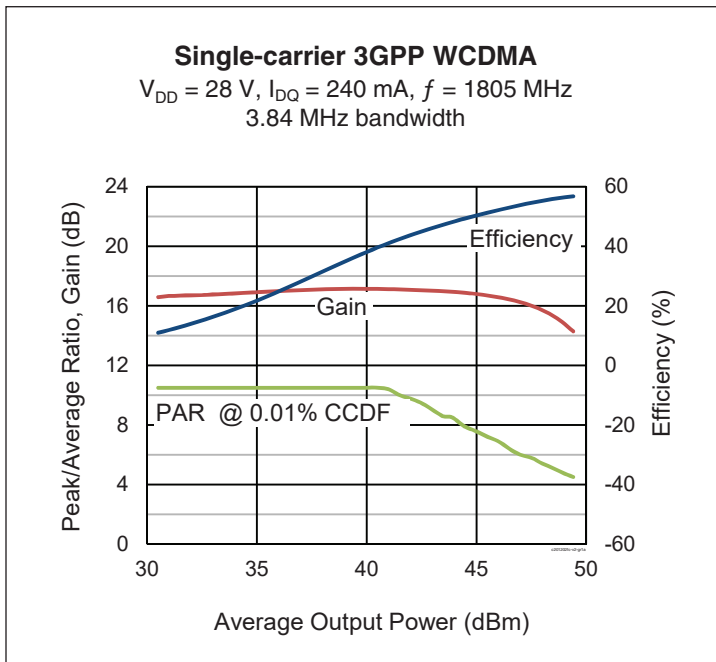
The PXAC201202FC is a 120-watt LDMOS FET for use in multi-standard cellular power amplifier applications in the 1800 to 2200 MHz frequency band. Its asymmetric and dual-path design make it ideal for Doherty amplifier designs. It features input and output matching, and a thermally-enhanced package with earless flange. Manufactured with Wolfspeed's advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



PXAC201202FC  
Package H-37248-4

### Features

- Broadband internal matching
- Asymmetric Doherty design
  - Main: P1dB = 35 W Typ
  - Peak: P1dB = 80 W Typ
- CW performance in a Doherty configuration, 1805 MHz, 28 V
  - Output power = 100 W P1dB
  - Gain = 17.3 dB at 17.8 W Avg.
  - Efficiency = 46% at 17.8 W Avg.
- CW performance in a Doherty configuration, 2100 MHz, 28 V
  - Output power = 15.8 W Avg.
  - Gain = 15.5 dB
  - Efficiency = 46%
- Capable of handling 10:1 VSWR @ 28 V, 16 W (CW) output power
- Integrated ESD protection: Human Body Model, Class 1C (per JESD22-A114)
- Low thermal resistance
- Pb-free and RoHS compliant



### RF Specifications, 1880 MHz

#### One-carrier WCDMA Characteristics (tested in Wolfspeed Doherty test fixture)

$V_{DD} = 28\text{ V}$ ,  $V_{GS(peak)} = 1.4\text{ V}$ ,  $I_{DQ} = 240\text{ mA}$ ,  $P_{OUT} = 16\text{ W}$  average,  $f = 1880\text{ MHz}$ . 3GPP WCDMA signal: 3.84 MHz bandwidth, 10 dB PAR @0.01% probability on CCDF.

| Characteristic               | Symbol   | Min | Typ | Max | Unit |
|------------------------------|----------|-----|-----|-----|------|
| Gain                         | $G_{ps}$ | 16  | 17  | —   | dB   |
| Drain Efficiency             | $\eta_D$ | 43  | 46  | —   | %    |
| Adjacent Channel Power Ratio | ACPR     | —   | -29 | -26 | dBc  |

All published data at  $T_{CASE} = 25^\circ\text{C}$  unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

## RF Specifications, 2140 MHz

**One-carrier WCDMA Characteristics** (not subject to production test—verified by design/characterization in Wolfspeed Doherty test fixture)

$V_{DD} = 28\text{ V}$ ,  $V_{GS(\text{peak})} = 1.2\text{ V}$ ,  $I_{DQ} = 240\text{ mA}$ ,  $P_{OUT} = 16\text{ W}$  average,  $f = 2140\text{ MHz}$ . 3GPP WCDMA signal: 3.84 MHz bandwidth, 10 dB PAR @0.01% CCDF.

| Characteristic               | Symbol   | Min  | Typ  | Max | Unit |
|------------------------------|----------|------|------|-----|------|
| Gain                         | $G_{ps}$ | 16.0 | 16.5 | —   | dB   |
| Drain Efficiency             | $\eta_D$ | 39   | 42   | —   | %    |
| Adjacent Channel Power Ratio | ACPR     | —    | −29  | −27 | dBc  |

## DC Characteristics

| Characteristic                 | Conditions                                               | Symbol              | Min | Typ  | Max  | Unit          |
|--------------------------------|----------------------------------------------------------|---------------------|-----|------|------|---------------|
| Drain-source Breakdown Voltage | $V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$          | $V_{(BR)DSS}$       | 65  | —    | —    | V             |
| Drain Leakage Current          | $V_{DS} = 28\text{ V}$ , $V_{GS} = 0\text{ V}$           | $I_{DSS}$           | —   | —    | 1.0  | $\mu\text{A}$ |
|                                | $V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$           | $I_{DSS}$           | —   | —    | 10.0 | $\mu\text{A}$ |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$           | $I_{GSS}$           | —   | —    | 1.0  | $\mu\text{A}$ |
| On-state Resistance            | (main) $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$  | $R_{DS(\text{on})}$ | —   | 0.3  | —    | $\Omega$      |
|                                | (peak) $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$  | $R_{DS(\text{on})}$ | —   | 0.16 | —    | $\Omega$      |
| Operating Gate Voltage         | (main) $V_{DS} = 28\text{ V}$ , $I_{DQ} = 242\text{ mA}$ | $V_{GS}$            | 2.5 | 2.69 | 2.8  | V             |
|                                | (peak) $V_{DS} = 28\text{ V}$ , $I_{DQ} = 0\text{ A}$    | $V_{GS}$            | 0.5 | 0.7  | 1.6  | V             |

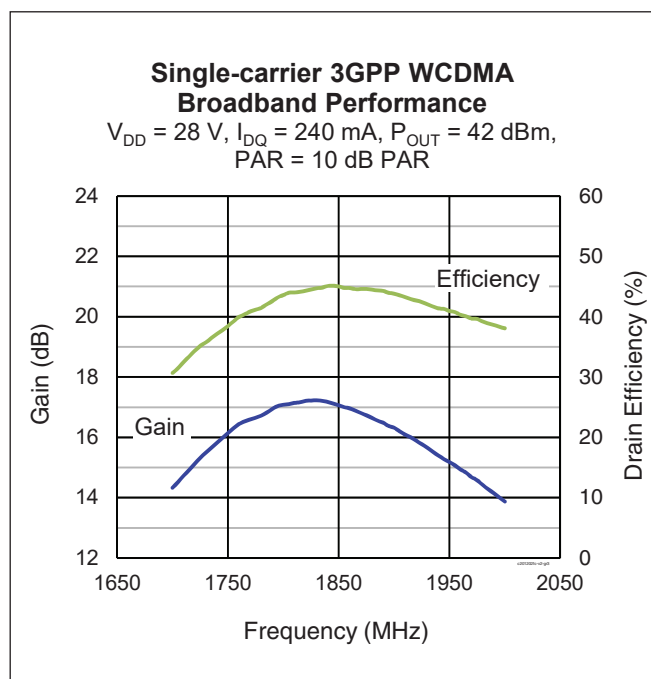
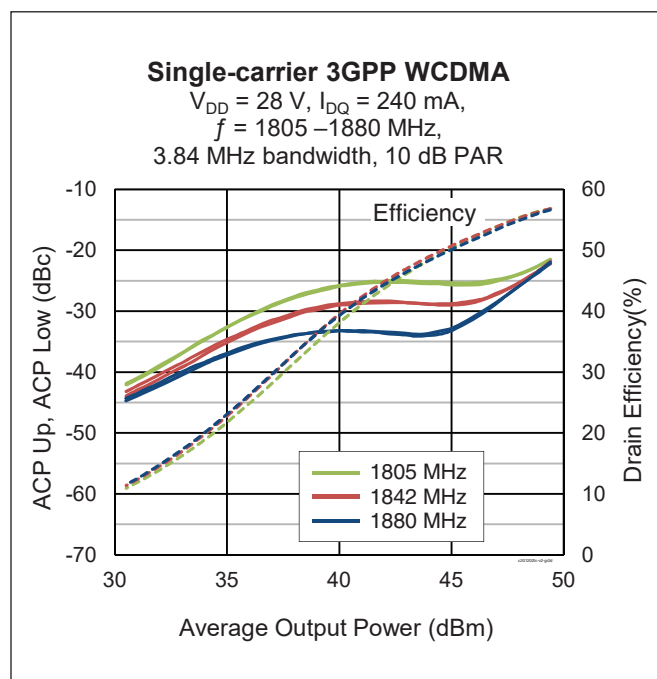
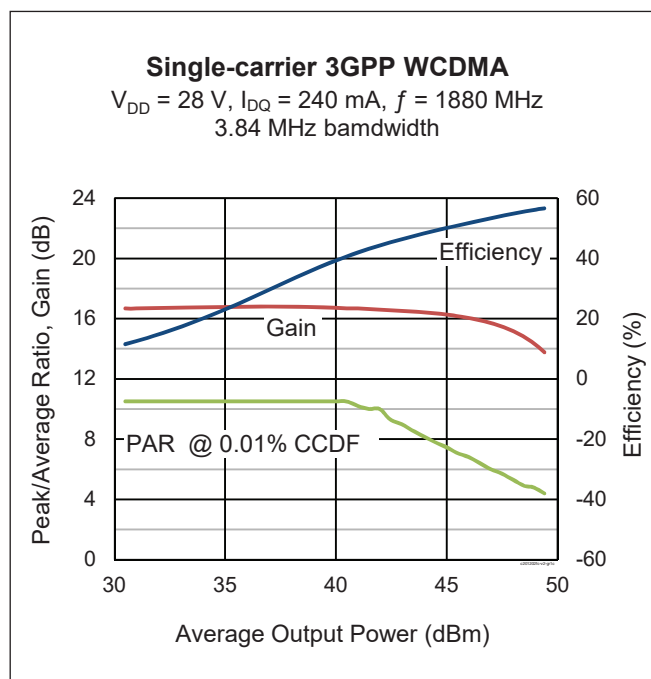
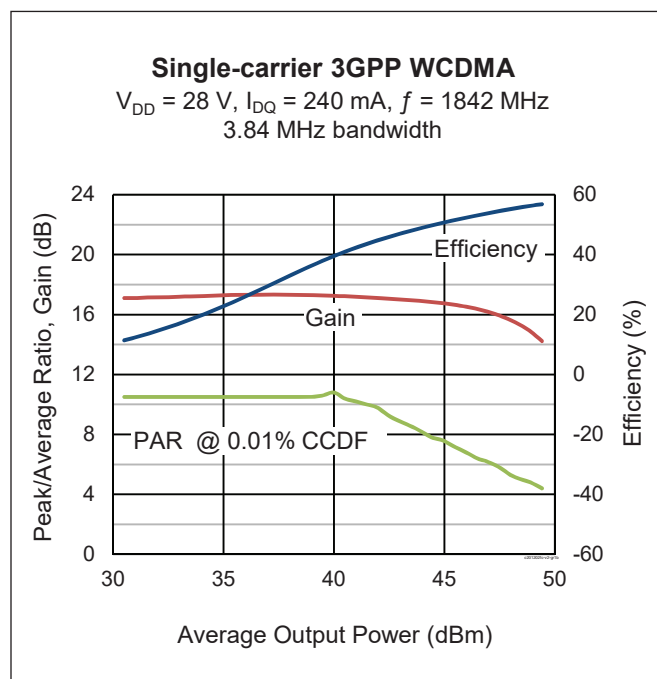
## Maximum Ratings

| Parameter                                                        | Symbol          | Value       | Unit                 |
|------------------------------------------------------------------|-----------------|-------------|----------------------|
| Drain-source Voltage                                             | $V_{DSS}$       | 65          | V                    |
| Gate-source Voltage                                              | $V_{GS}$        | −6 to +10   | V                    |
| Operating Voltage                                                | $V_{DD}$        | 0 to +32    | V                    |
| Junction Temperature                                             | $T_J$           | 225         | $^{\circ}\text{C}$   |
| Storage Temperature Range                                        | $T_{STG}$       | −65 to +150 | $^{\circ}\text{C}$   |
| Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 100 W CW) | $R_{\theta JC}$ | 0.7         | $^{\circ}\text{C/W}$ |

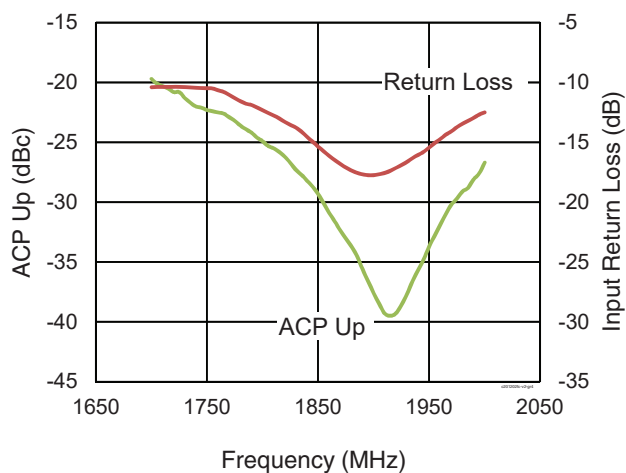
## Ordering Information

| Type and Version     | Order Code           | Package and Description                 | Shipping             |
|----------------------|----------------------|-----------------------------------------|----------------------|
| PXAC201202FC V2 R0   | PXAC201202FC-V2-R0   | H-37248-4, ceramic open-cavity, earless | Tape & Reel, 50 pcs  |
| PXAC201202FC V2 R250 | PXAC201202FC-V2-R250 | H-37248-4, ceramic open-cavity, earless | Tape & Reel, 250 pcs |

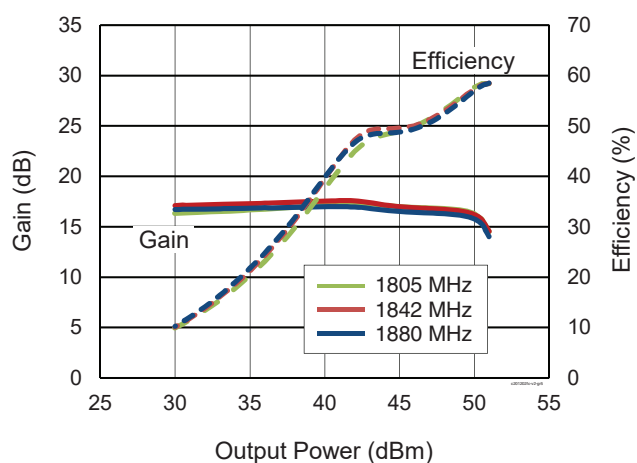
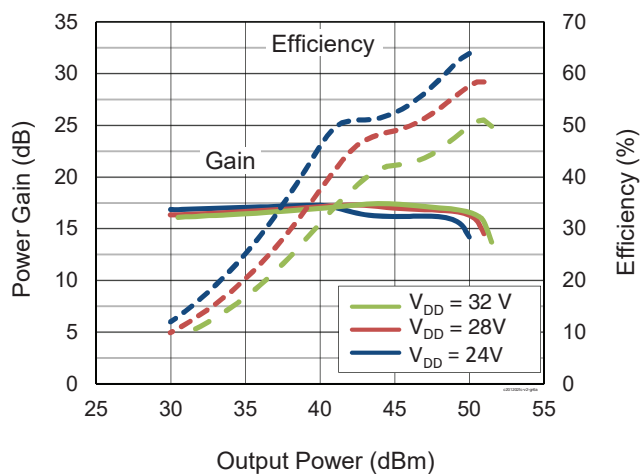
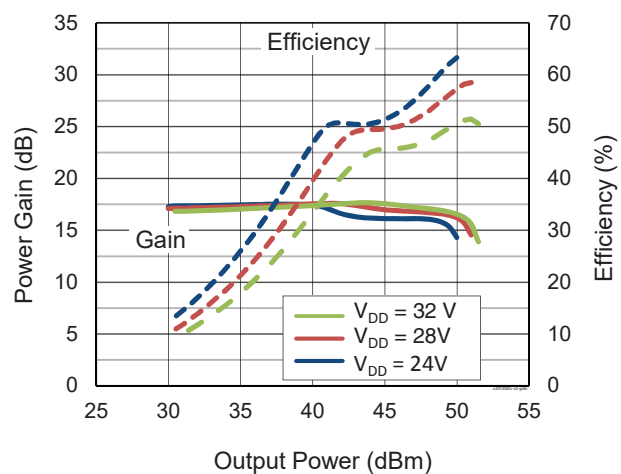
# Typical Performance (data taken in an Wolfspeed test fixture)

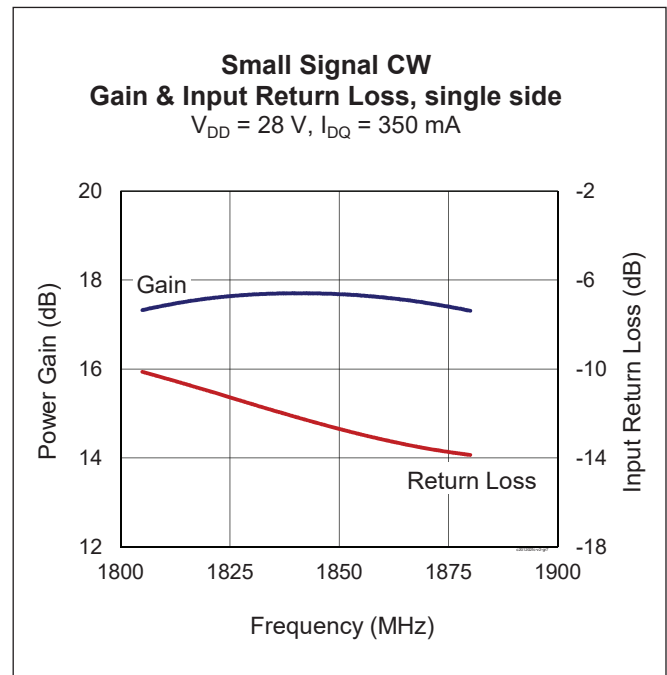
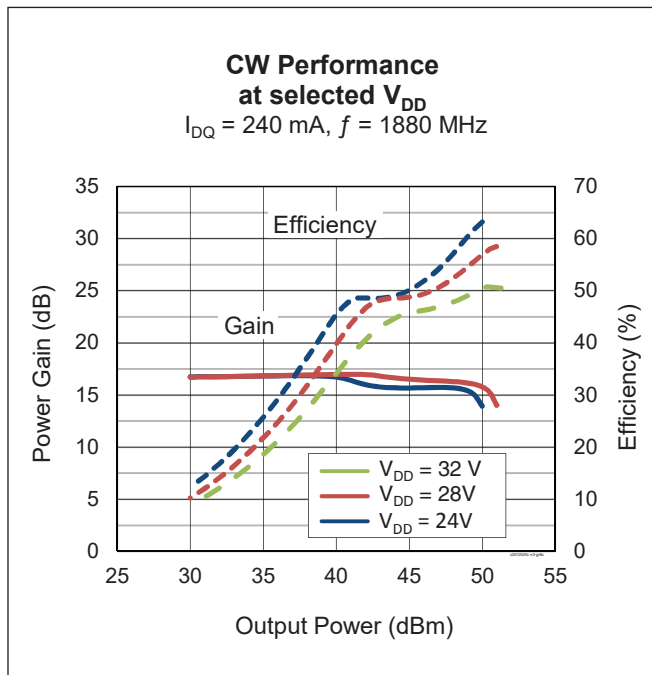


## Typical Performance (cont.)

Single-carrier 3GPP WCDMA  
Broadband Performance
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 240\text{ mA}$ ,  $P_{OUT} = 42\text{ dBm}$ ,  
PAR = 10 dB


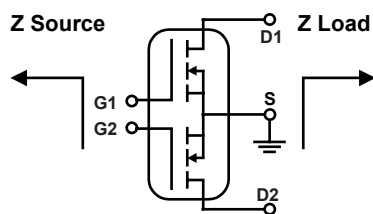
## CW Performance

 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 240\text{ mA}$ 
CW Performance  
at selected  $V_{DD}$ 
 $I_{DQ} = 240\text{ mA}$ ,  $f = 1805\text{ MHz}$ 
CW Performance  
at selected  $V_{DD}$ 
 $I_{DQ} = 240\text{ mA}$ ,  $f = 1842.5\text{ MHz}$ 


**Typical Performance** (cont.)

See next page for load pull performance

## Load Pull Performance



Main side pulsed CW signal: 160  $\mu$ sec, 10% duty cycle; 28 V, 250 mA

| Class AB   |                             | P <sub>1dB</sub>            |           |                        |                      |         |                             |           |                        |                      |         |
|------------|-----------------------------|-----------------------------|-----------|------------------------|----------------------|---------|-----------------------------|-----------|------------------------|----------------------|---------|
|            |                             | Max Output Power            |           |                        |                      |         | Max PAE                     |           |                        |                      |         |
| Freq [MHz] | Z <sub>s</sub> [ $\Omega$ ] | Z <sub>l</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] | Z <sub>l</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] |
| 1810       | 3.92 – j12.74               | 8.74 – j8.12                | 19.55     | 46.79                  | 47.75                | 53.6    | 14.51 – j15.32              | 21.55     | 45.00                  | 31.65                | 62.1    |
| 1840       | 4.13 – j12.84               | 8.56 – j7.87                | 19.43     | 46.58                  | 45.50                | 52.3    | 15.46 – j14.87              | 21.52     | 44.81                  | 30.28                | 61.3    |
| 1880       | 4.54 – j14.31               | 8.66 – j8.19                | 19.37     | 46.92                  | 49.20                | 55.3    | 18.77 – j12.73              | 21.53     | 45.05                  | 31.98                | 65.2    |

Peak side pulsed CW signal: 160  $\mu$ sec, 10% duty cycle; 28 V, 540 mA

| Class AB   |                             | P <sub>1dB</sub>            |           |                        |                      |         |                             |           |                        |                      |         |
|------------|-----------------------------|-----------------------------|-----------|------------------------|----------------------|---------|-----------------------------|-----------|------------------------|----------------------|---------|
|            |                             | Max Output Power            |           |                        |                      |         | Max PAE                     |           |                        |                      |         |
| Freq [MHz] | Z <sub>s</sub> [ $\Omega$ ] | Z <sub>l</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] | Z <sub>l</sub> [ $\Omega$ ] | Gain [dB] | P <sub>OUT</sub> [dBm] | P <sub>OUT</sub> [W] | PAE [%] |
| 1810       | 3.75 – j8.61                | 2.62 – j5.15                | 18.47     | 49.89                  | 97.50                | 48.3    | 4.96 – j7.28                | 20.92     | 48.49                  | 70.63                | 59.9    |
| 1840       | 3.69 – j8.66                | 2.99 – j4.99                | 19.05     | 49.85                  | 96.61                | 51.0    | 5.17 – j6.42                | 20.80     | 48.71                  | 74.30                | 59.2    |
| 1880       | 5.57 – j9.39                | 3.09 – j5.13                | 19.31     | 50.12                  | 102.8                | 50.1    | 6.31 – j6.59                | 21.34     | 48.55                  | 71.61                | 63.2    |

## Reference Circuit, 1880 MHz

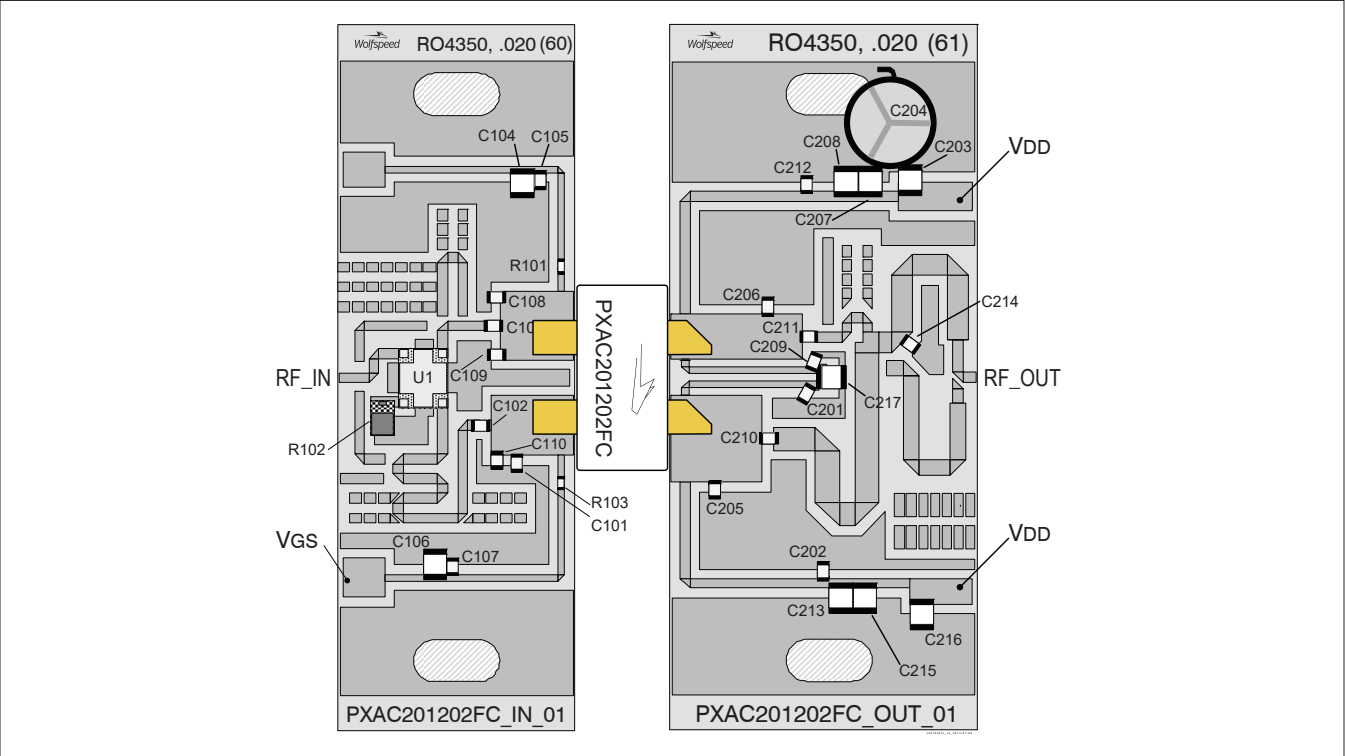
DUT PXAC201202FC V2

Reference Circuit Part No. LTA/PXAC201202FC V2

PCB Rogers 4350, 0.508 mm [.020"] thick, 2 oz. copper,  $\epsilon_r = 3.66$

Find Gerber files for this reference fixture on the Wolfspeed Web site at ([www.wolfspeed.com/RF](http://www.wolfspeed.com/RF))

Reference Circuit (cont.)

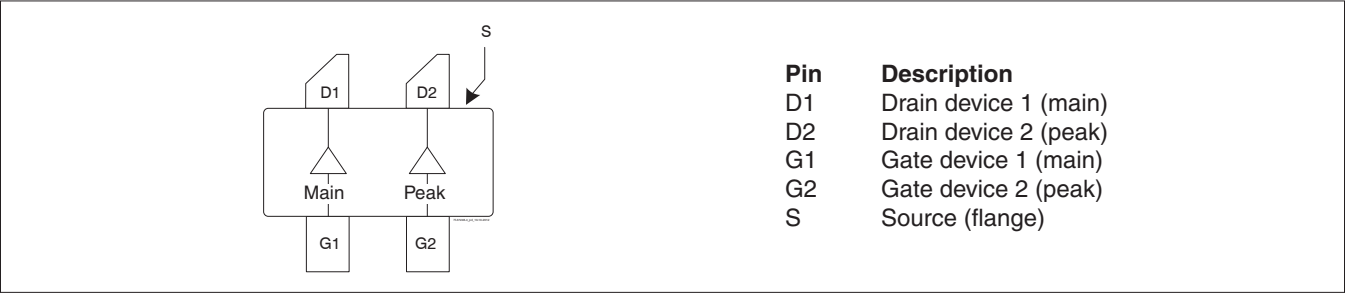


Reference circuit assembly diagram (not to scale)

Component Information

| Component                                | Description                  | Manufacturer                       | P/N              |
|------------------------------------------|------------------------------|------------------------------------|------------------|
| <b>Input</b>                             |                              |                                    |                  |
| C101                                     | Chip capacitor, 2.2 pF       | ATC                                | ATC600F2R2CW250T |
| C102, C105, C107                         | Chip capacitor, 18 pF        | ATC                                | ATC600F180JW250T |
| C103                                     | Chip capacitor, 1.5 pF       | ATC                                | ATC600F1R5CW250T |
| C104, C106                               | Capacitor, 10 $\mu$ F, 50 V  | Taiyo Yuden                        | UMK325C7106MM-T  |
| C108                                     | Chip capacitor, 0.3 pF       | ATC                                | ATC600F0R3CW250T |
| C109, C110                               | Chip capacitor, 0.3 pF       | ATC                                | ATC600F0R3CW250T |
| R101, R103                               | Resistor, 10 Ohm             | Panasonic Electronic Components    | ERJ-3GEYJ        |
| R102                                     | Resistor, 50 Ohm             | Anaren                             | RFP060120A15Z50  |
| U1                                       | Hybrid coupler, 5 dB, 90°    | Anaren                             | X3C19P1-05S      |
| <b>Output</b>                            |                              |                                    |                  |
| C201, C202, C209, C210, C211, C212       | Chip capacitor, 18 pF        | ATC                                | ATC600F180JW250T |
| C203, C207, C208, C213, C215, C216, C217 | Capacitor, 10 $\mu$ F, 50 V  | Taiyo Yuden                        | UMK325C7106MM-T  |
| C204                                     | Capacitor, 220 $\mu$ F, 50 V | Cornell Dubilier Electronics (CDE) | SK221M050ST      |
| C205                                     | Chip capacitor, 1.8 pF       | ATC                                | ATC600F1R8CW250T |
| C206                                     | Chip capacitor, 0.3 pF       | ATC                                | ATC600F0R3CW250T |
| C214                                     | Chip capacitor, 0.5 pF       | ATC                                | ATC600F0R5CW250T |

Pinout Diagram (top view)



See next page for package mechanical specifications

## Package Outline Specifications

### Package H-37248-4

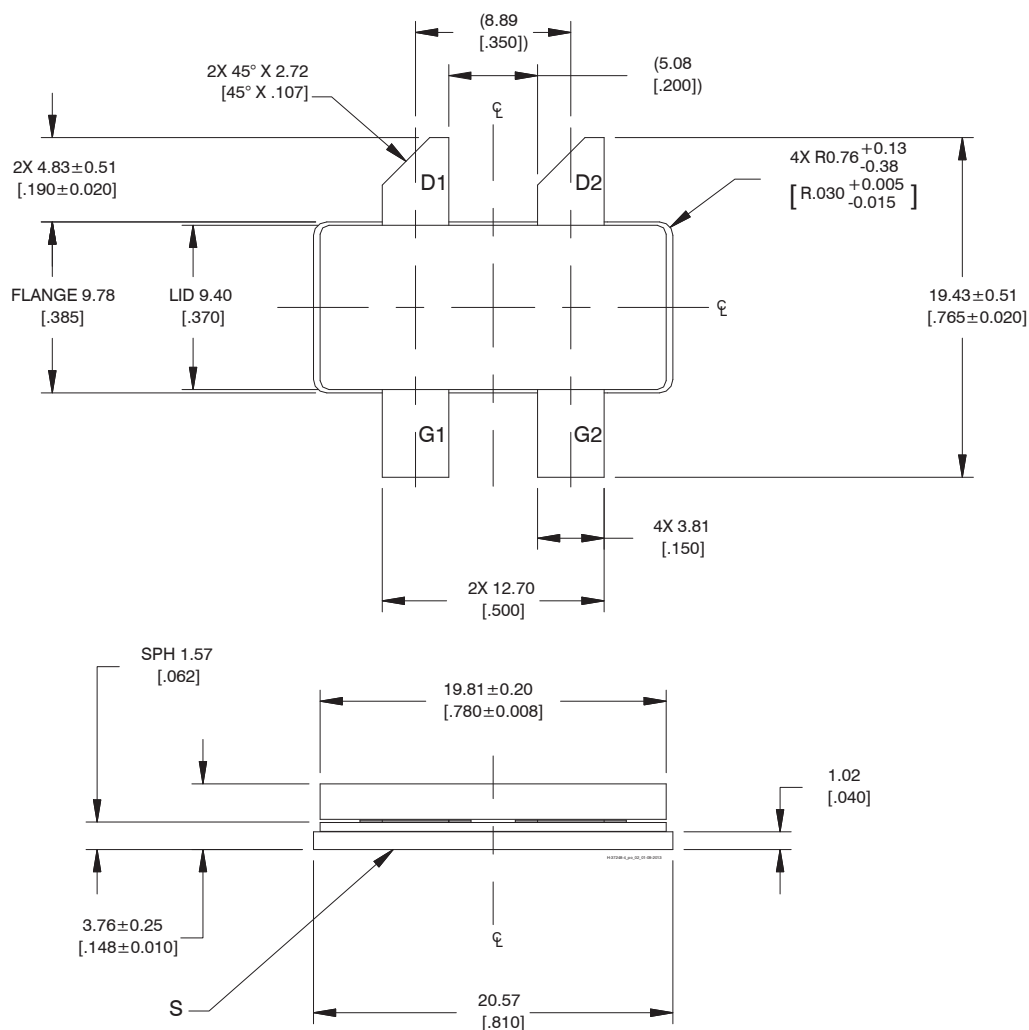


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [.005].
4. Pins: D1, D2 – drain, S (flange) – source, G1, G2 – gate.
5. Lead thickness: 0.10 +0.076/–0.025 [.004 +.003/–.001].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

## Revision History

| Revision | Date       | Data Sheet Type | Page       | Subjects (major changes in comparison with previous revision)                                                       |
|----------|------------|-----------------|------------|---------------------------------------------------------------------------------------------------------------------|
| 01       | 2014-02-06 | Advance         | All        | New product, proposed only.                                                                                         |
| 02       | 2014-03-07 | Production      | All        | Data Sheet reflects released product specifications, including reference circuit and performance information.       |
| 03       | 2014-03-12 | Production      | 1, 2, 3, 6 | (1) Add features, update graph. (2) Update Operating Gate Voltage. (3) Update two graphs. (6) Add Load Pull tables. |
| 04       | 2014-06-27 | Production      | All        | Product now V2.                                                                                                     |
| 04.1     | 2014-08-25 | Production      | 7          | Assembly diagram: position of C201 changed.                                                                         |
| 05       | 2014-08-25 | Production      | 2          | RF Specifications at 2140 MHz: values updated.                                                                      |
| 05.1     | 2016-06-22 | Production      | 2          | Updated ordering information                                                                                        |
| 06       | 2018-06-29 | Production      | All        | Converted to Wolfspeed Data Sheet                                                                                   |

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## Notes

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